Automatic Plant Watering System Using Arduino Uno

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Abstract

The Automatic Plant Watering System using Arduino Uno is an innovative solution aimed at reducing the manual effort involved in plant care. The system utilizes a soil moisture sensor to continuously evaluate the moisture levels in the soil. When the moisture level drops below a specified threshold, the Arduino Uno triggers a water pump via a relay to irrigate the plant. The pump automatically deactivates once the soil attains the desired moisture level. This ensures efficient water usage and prevents both overwatering and underwatering. The system is simple, low-cost, and suitable for home gardens, greenhouses, and small farms. It promotes smart irrigation and supports sustainable agriculture practices.

Software:- Arduino IDE, Proteus 8 Professional.

1. Introduction

Watering plants regularly is essential for their healthy growth, but it can be difficult to manage due to a busy lifestyle or lack of knowledge about proper watering needs. The Arduino Uno-based Automatic Plant Watering System is developed to tackle this problem by employing a soil moisture sensor that continuously monitors the soil's status in real-time.

When the soil becomes dry, the system automatically activates a water pump to irrigate the plant, and stops once the soil is sufficiently moist. This smart system reduces water wastage, minimizes human effort, and ensures timely watering, making it ideal for home gardens, greenhouses, and small-scale farming. The project combines simplicity, cost-effectiveness, and automation to promote sustainable plant care.

2. Material

LED Display, Arduino Uno, Moisture Detection sensor, Relay module, Water Pump (Motor)
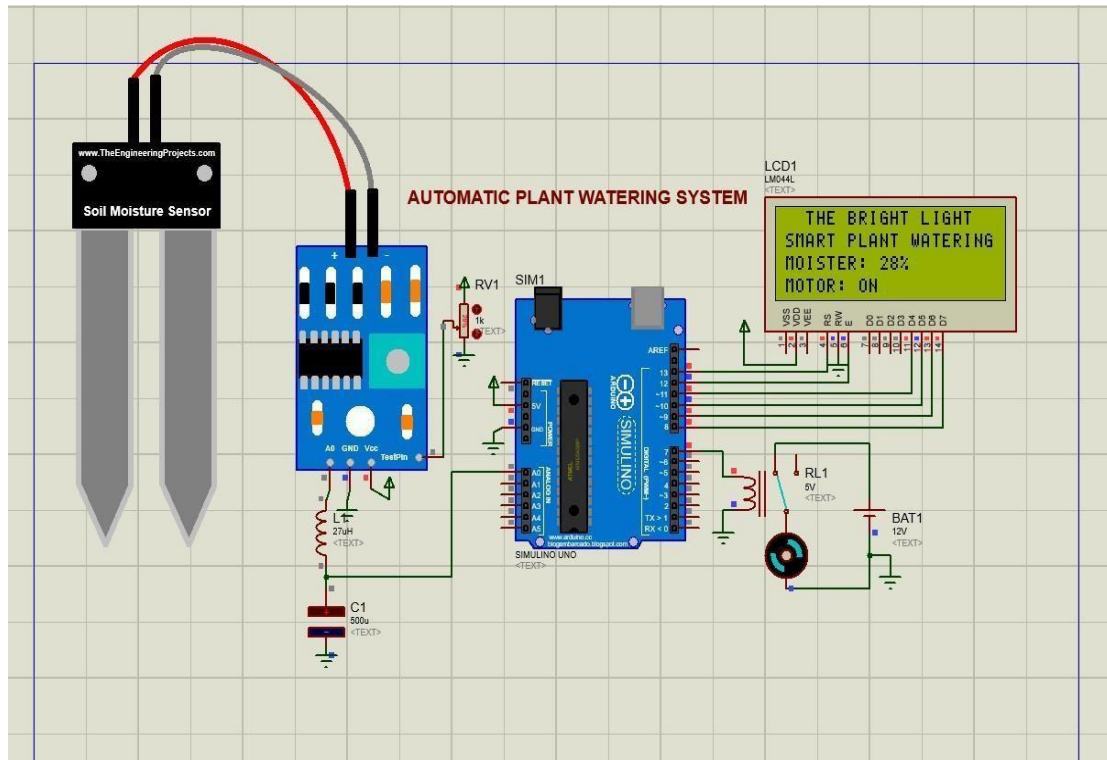
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3.   Methodology

Fig.1. Simulator Diagram

Working Concept:

1. Arduino Uno: Acts as the brain of the system, processing data from sensors and executing programmed instructions

2. Soil Moisture Sensor: Sends analog or digital signals to the Arduino Uno, indicating whether the soil is dry or sufficiently moist.

3. Relay Module: Utilized to activate or deactivate the motor (water pump), providing isolation between the low-power Arduino circuit and the high-power motor circuit..

4. The motor serves as the water pump responsible for delivering water to the plants.

5. Power Supply: Provides electrical power to the entire system, including the Arduino, relay module, motor, and sensors.

6. LCD Display   : The system provides feedback to the user through the LCD display or other indicators.
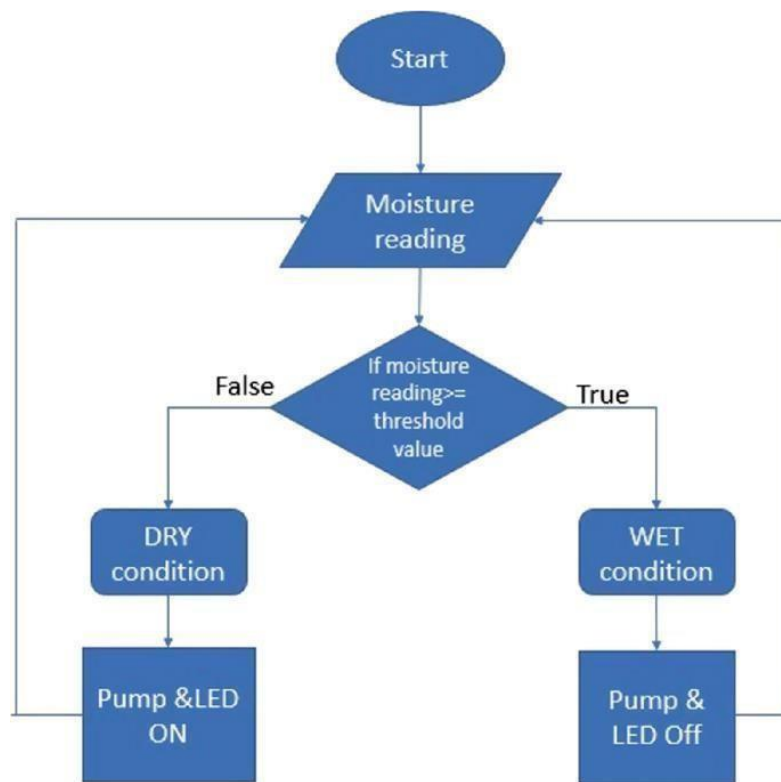
4. Flow Chart

Fig 2. Flow chart

Working Principle:

1. Soil Moisture Sensing:

   A soil moisture sensor is placed within the soil to provide continuous measurements of the moisture content. The sensor produces an analog signal corresponding to the soil's moisture content — low value for dry soil and high value for wet soil.

2. Data Processing with Arduino Uno:

   The analog signal from the sensor is sent to the Arduino Uno's analog input pin. The Arduino measures the moisture level and evaluates it against a predetermined threshold value specified in the code.

3. Condition Checking:

   If the moisture level is below the threshold, the soil is dry and needs watering.

   If the moisture level is above the threshold, the soil is sufficiently wet and doesn't need watering
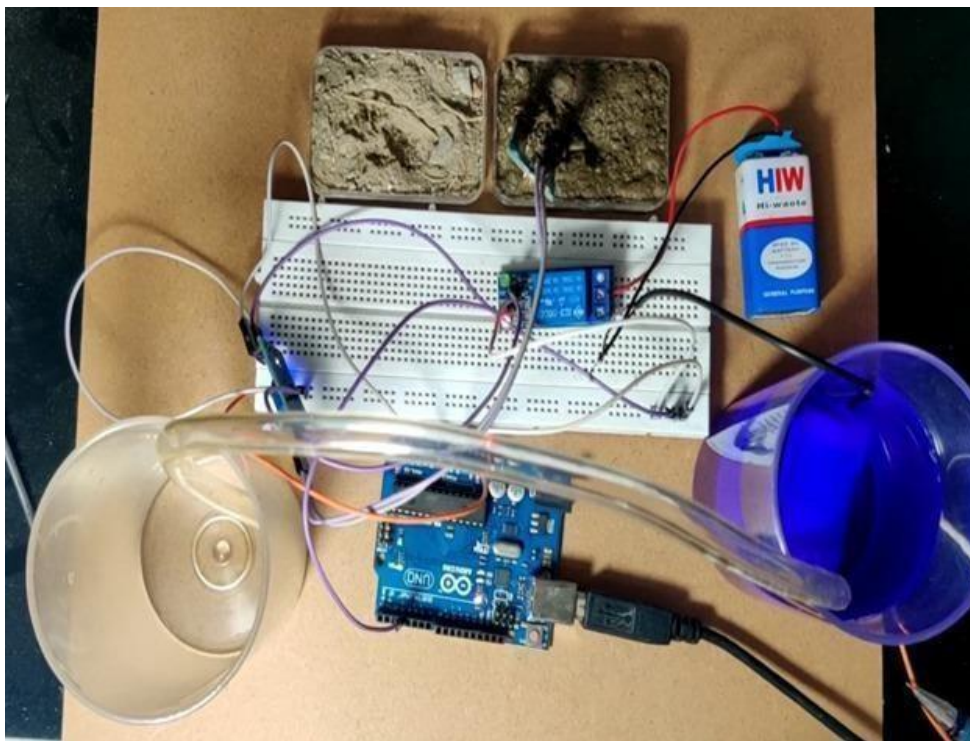
4. Pump and LED Control:

In dry condition:

• Arduino turns ON the water pump to start watering.

• An LED indicator also turns on to show the watering process is active.

5 .Continuous Monitoring:

The system runs in a continuous loop**,** ensuring the plant is watered only when necessary, conserving water and reducing manual effort.

5.   Result

The main result of an automatic plant watering system using Arduino is the automation of the plant watering process based on real-time soil moisture levels. This system ensures that plants receive the right amount of water at the right time without requiring manual intervention.

The system automatically waters the plant when the soil moisture falls below a predetermined threshold. This ensures that plants are watered only when needed, reducing the risk of overwatering or underwatering.
By only watering the plant when necessary, the system conserves water, making it environmentally friendly and efficient. It mitigates the potential for water wastage linked to manual irrigation. the main result is an automated, efficient, and reliable watering system that helps keep plants healthy, conserves water, and reduces the need for manual care.

6. Conclusion

In conclusion, an Arduino-based automatic plant watering system is a smart, cost-effective, and environmentally friendly solution for managing plant care. It ensures optimal moisture levels, reduces water waste, and frees up time for the plant owner. The system's ease of customization and scalability make it an excellent choice for both beginners and experienced gardeners alike.

7. Conflict of Interest

The authors declare that they have no conflict of interest.

8. Funding Declaration

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

9. Reference

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About Authors

Miss. Prachi Dattatray Bhagyawant is currently pursuing a Bachelor's Degree in Electronics and Telecommunication Engineering at Dr. Babasaheb Ambedkar Technological University. Her academic and research interests include automation, Microcontroller (Arduino, Raspberry Pi), real-world environmental and agricultural challenges.

Prachi has hands-on experience in C programming and is skilled in Arduino IDE, Proteus, Audacity for project implementation. Recent work focuses on the integration of low cost sensing and control systems using platforms such as Arduino promote sustainable and intelligent resource management. This project is a demonstration of this approach aiming to enhance water use efficiency in domestic and small scale agricultural settings.